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Globalization and the effects of changes in functional income distribution on aggregate demand in Germany*

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Abstract — Germany has experienced a period of extreme nominal and real wage moderation since the mid 1990s. Contrary to the expectations of liberal economists this has failed to improve Germany's mediocre economic performance. However, Germany is now running substantial current account surpluses. One possible explanation for Germany's disappointing performance is found in Kaleckian theory, which highlights that the domestic demand effect of a decline in the wage share will typically be contractionary, whereas net exports will increase (Blecker 1989). The size of the foreign demand effect will critically depend on the degree of openness of the economy. The paper aims at estimating the demand side of a Bhaduri-Marglin (1990) –type model empirically for Germany. The paper builds on the estimation strategy of Stockhammer, Onaran and Ederer (2007) and Hein and Vogel (2008a, 2008b). The main contribution lies in a careful analysis of the effects of globalization. Since Germany is a large open economy by now it is a particularly interesting case study.

Keywords: distribution, demand, investment, consumption, foreign trade, macroeconomics, Keynesian economics, Germany, globalization

JEL-Classification: E12. E20. E22. E25. E61

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1. Introduction

Germany has experienced a period of extreme wage moderation since the mid 1990s. Contrary to the expectations of liberal economists this has failed to improve Germany's mediocre economic performance. However, Germany is now running substantial current account surpluses. One possible explanation for Germany's disappointing performance is found in Kaleckian theory, which highlights that the domestic demand effect of a decline in the wage share will typically be contractionary, whereas net exports will increase (Blecker 1989).

The paper aims at estimating the demand side of a Bhaduri-Marglin (1990)-type model empirically for Germany. The paper builds on the estimation strategy of Stockhammer, Onaran and Ederer (2007) and Hein and Vogel (2008a, 2008b). The main contribution lies in the careful analysis of the international trade. Germany is Europe's largest economy, but it is also a rather open economy. Its export share in GDP rose from 16% in 1970 to 47% in 2007.[1] Germany experienced a dramatic increase in international trade and can be characterized as a large open economy. It is therefore a particularly interesting case study, in particular, because it has witnessed a drastic form of nominal and real wage moderation since the mid 1990s (Hein, Schulten and Truger 2006).

The contribution of this paper lies in the treatment of the effects of globalization. Globalization is here (as elsewhere) defined by the increase in international trade and capital flows. It has had several effects on how changes in functional income distribution affect aggregate demand. First imports and exports have grown much faster than GDP. With given price elasticities this means that absolute effects of a nominal wage change will increase.

[1] These values are synthethic values for Germany that are used in the econometric analysis. It consists of German data from 1991 onwards that are chained backwards with West German growth rates for the period 1970-1990. The West German export share in 1970 was 21%.

Second, a substantial part of international trade is trade in intermediate rather than final goods; this trend is often referred to as outsourcing and export effects have to be adjusted for it. Third, as imports and exports have increased, so have competitive pressures, which presumably have also lead to changes in price formation. Similarly price elasticities for imports and exports may have changed. Forth, capital mobility has increased. While this is very clear for financial capital flows its effects on physical capital stocks, that is investment, is less clear.

In this paper the question how globalization has affected the demand effects of changes in the functional distribution of income is investigated. The motivation of this analysis is that in the empirical Post Keynesian literature a consensus seems to have emerged that the domestic sector in most economies is wage-led. However, the foreign component of demand may turn the demand regime into profit-led. Globalization may have brought to an end the wage-led demand regimes of the relatively closed economies in the postwar era. While the important role of international trade was recognized early on in the development in Post Kaleckian models (Blecker 1989, Bhaduri and Marglin 1990), empirical studies have remained basic in their analysis of international trade. Bowles and Boyer (1995) estimated the net export share as a function of the wage share for several countries. Naastepad and Storm (2006) and Hein and Vogel (2008a, 2008b) use the same approach for different countries and time periods. Naastepad and Storm find very small trade effects (compared to consumption and investment effects). Hein and Vogel (2008a) fail to find any (statistically significant) effect for most countries, whereas Hein and Vogel (2008b) find a rather strong effect in Germany. However their method implies that they are not allowing for any effects of globalization. Stockhammer, Onaran and Ederer (2007) offer a more sophisticated treatment. They estimate price equations and import and export equations. Because of this procedure increasing import and export shares play a role despite the fact that constant import and export elasticities are assumed. One aspect of globalization is therefore recognized. The

contribution of this paper is that further effects of globalization on distribution-led demand regimes are addressed.

The paper is structured as follows. Section 2 presents the theoretical background and the post-Kaleckian model, on which the empirical estimations are based. Section 3 summarizes the empirical literature on these models. Section 4 presents the econometric results for the effect of changes in functional income distribution on private consumption, private investment and net exports. Section 5 summarizes the key findings and discusses policy conclusions.

2. Theoretical background: wage-led und profit-led demand regimes

This section will present the macroeconomic model that forms the basis for the empirical analysis of the effects of changes in functional income distribution on aggregate demand. The model allows for wage-led as well as profit-led demand regimes and is similar in spirit to Bhaduri and Marglin (1990). Aggregate demand (Y) is the sum of consumption (C), investment (I), net exports (NX) and government expenditure (G). All variables are in real terms. In a general formulation, consumption, investment and net exports are written as functions of income (Y), the wage share (Ω),[2] and some other control variables (summarized as z). These latter are assumed to be independent of output and distribution. Government expenditures are considered to be a function of output only. Aggregate demand then is:

$$Y = C(Y,\Omega) + I(Y,\Omega,z_I) + NX(Y,P,z_{NX}) + G(Y,z_G) \qquad (1)$$

and the price level, P, is:

[2] Functional income distribution and its measure, the wage share, are used synonymously throughout this paper.

$$P = f(\Omega, z_P) \qquad (2)$$

This model is rather general in that it can be reduced to a standard Keynesian short-run model (e.g Blanchard 2006) if $\partial C/\partial \Omega$ and $\partial I/\partial \Omega$ are assumed to be zero.

The inclusion of income distribution shall briefly be motivated. In the consumption function the basic assertion is that wage incomes (W) and profit incomes (R) are associated with different propensities to consume. The Kaleckian assumption is that the marginal propensity to save is higher for capital incomes than for wage income; consumption is therefore expected to increase when the wage share rises. The basic reason for this is that major parts of profits are retained by firms and hence cannot be consumed.

Standard investment functions depend on output (Y) and the long-term real interest rate or some other measure of the cost of capital. In addition to that, investment, in our model, is expected to decrease when the wage share rises because future profits may be expected to fall. In classical economics it was a straightforward assumption that capital accumulation was a positive function of the rate of profit. Consequently investment ought to be a function of profits. Today it is often argued that retained earnings are a privileged source of finance and may thus influence investment expenditures. This had already been highlighted by Kalecki (1954, 1971) and been rediscovered in the 1980s by mainstream economists (Stiglitz and Weiss 1981).

The contribution of this paper lies in the careful analysis of the effect of distribution on net exports. Net exports are a negative function of domestic demand, a positive function of foreign demand, and will depend negatively on domestic prices. Domestic prices in turn depend on domestic nominal unit labor costs (ULC) and on import prices. It is important to note that this structure implies that net exports depend (among other things) on (changes in)

the wage share if a change in the latter is associated with a change in nominal unit labor costs and hence domestic prices.[3] As the price equation indicates the marginal effect of a change in ULC on prices, expressing the relation between real unit labor costs and prices is only a matter of re-parametrization. Real unit labor costs in the data set we use are identical with the wage share.[4]

Globalization in our context refers to the increase in international trade and the increase in the international division of labor. Four potential effects of globalization will be investigated.

First, the increase in international trade is reflected in a rising trend in export shares and import shares. Therefore a change in the wage share will have different effects on net exports at the beginning and at the end of our sample even if the price elasticity of exports (and imports) remains stable. This effect will become visible, when converting the elasticities obtained from the regression analysis into partial effects.

Second, globalization comes with an increase in the international division of labor. This not only refers to final goods, but also to intermediate goods. An increasing share of inputs in production comes from abroad. In recent discussions this is frequently referred to as (international) outsourcing. This is also the case for export goods. Contrary to consumption and investment, export and imports are not value added magnitudes, but gross production values. Therefore an increase (reduction) in exports will by definition cause and an increase (decrease) in imports.

Consequently, a loss in competitiveness will not only have the standard effects on exports and imports via prices, but it will also have a 'perverse' indirect effect on imports (reflected in the middle term in the brackets in equation 3). As exports decrease, so does the import

[3] From a theoretical point of view this is not required, as is shown in Hein and Vogel (2008a, 2008b), but empirically this seems to be the case as will be seen below.

[4] In the OECD dataset that is used in this paper real unit labor costs (RULC) are by definition substantially identical to the wage share. As nominal unit labor costs and the GDP deflator are price indices, RULC differs numerically form the wage share.

demand associated with the production process of export goods. The total effect of a change in the wage share on net exports is:

$$\frac{d(NX)}{d\Omega} = \left(\frac{\partial X}{\partial P} + \frac{\partial M}{\partial X}\frac{\partial X}{\partial P} - \frac{\partial M}{\partial P} \right) \frac{\partial P}{\partial \Omega} \tag{3}$$

Third, the increase in international trade may affect some behavioral functions in our estimations due to an increase in international competition. This may affect the price elasticities of exports and imports as well as the role of ULC in the price equation. Therefore the relevant behavioral equations will be estimated for sub-periods to investigate whether a change in the relevant parameters did take place. For consistency all behavioral functions will be estimated for sub-periods.

Fourth, the increase in capital mobility may have increased the profit-sensitivity of investment. While there is ample evidence that financial capital has become internationally mobile, the degree of mobility is less clear for physical capital. Hatzius (2000) reports that FDI flows have become increasingly sensitive to labor costs. However, while it may be tempting to regard increased FDI flows as an indicator for the mobility of physical capital, this may be misleading as FDI also includes mergers and acquisitions and need not be linked to actual investment. Moreover it is not clear how outward FDI and domestic investment is related. The question to be addressed therefore is whether domestic investment has become more sensitive to profitability (or inversely, real unit labor costs). For lack of a better method this will also be investigated by estimating the investment function for sub-periods.

There are several limitations of the model presented above. First, government expenditures can react to income distribution; however this is ignored in our analysis, which focuses on the private sector. A serious treatment of the public sector is beyond the scope of this paper. Second, the model only covers the goods market. Typically the goods market is

complemented by a distribution function (Marglin and Bhaduri 1990) that describes the effects of changes in economic activity on income distribution. However, the focus of this paper is on the demand effects, and the wage share (Ω) is taken as exogenous. Thus feedbacks, for example, from growth on income distribution via lower unemployment and a better bargaining position of labor are ignored at this stage. It is therefore a partial model of a basic private open economy type.

Differentiating Y from equation (1) with respect to Ω and collecting terms gives

$$\frac{dY^*}{d\Omega} = \frac{h_2}{1-h_1} \tag{4}$$

where $h_1 = \left(\frac{\partial C}{\partial Y} + \frac{\partial I}{\partial Y} + \frac{\partial NX}{\partial Y} + \frac{\partial G}{\partial Y} \right)$ and $h_2 = \left(\frac{\partial C}{\partial \Omega} + \frac{\partial I}{\partial \Omega} + \frac{\partial NX}{\partial P} \frac{\partial P}{\partial \Omega} \right)$.

The term $1/(1-h_1)$ in equation (4) is a standard multiplier and has to be positive for stability. The sign of the total derivative therefore depends on the sign of the numerator. h_2 is the sum of the partial derivatives of the components of demand with respect to income distribution. This sum is *private excess demand*, that is, the change in demand caused by a change in income distribution given a certain level of income. It is impossible to sign h_2 a priori, since we hypothesize that $\partial C/\partial \Omega > 0$, $\partial I/\partial \Omega < 0$, and $\partial NX/\partial \Omega < 0$.[5] The sum of these effects can therefore only be determined empirically. Determining the sign of private excess demand is therefore the focus of the empirical estimations in this study. The total effect of the increase in the wage share on aggregate demand depends on the relative size of the reactions of the components of GDP, namely consumption, investment and net exports to changes in

[5] Hein and Vogel (2008a, 2008b) even keep ($\partial NX/\partial \Omega$) undetermined for theoretical reasons.

income distribution. If it is positive ($\partial Y^*/\partial \Omega > 0$), the demand regime is called *wage-led*. If the effect is negative ($\partial Y^*/\partial \Omega < 0$), it is called *profit-led.*

3. Related literature

The Bhaduri and Marglin (1990) model is a flexible Post-Kaleckian macro model that is widely used in modern Post Keynesian economics. It differs from the classical Kaleckian model because it allows for wage-led as well as profit-led demand regimes. The question whether the positive effect of an increase in the wage share on consumption outweighs the negative effect on investment and on net exports becomes an empirical one. It has thus inspired empirical literature, which will briefly survey here.[6]

The tests of the Bharduri-Marglin models can be grouped into two estimation strategies. The first group of papers tries to estimate the full model, that is, a goods market equilibrium relation and a distribution function. Stockhammer and Onaran (2004) estimate a structural VAR model consisting of the variables capital accumulation, capacity utilization, profit share, unemployment rate and labor productivity growth for the USA, UK and France. The goods market is estimated by a model based on Marglin and Bhaduri (1990). From the empirical investigation it is concluded that unemployment is determined by the goods market, and that the impact of income distribution on demand and employment is very weak. Technical progress is found to shift income distribution in favor of profits. Onaran and Stockhammer (2005) employ a similar model for Turkey and Korea and find some indication for wage-led demand regimes in these countries. Rather than net exports they include exports and imports separately. The advantage of the systems approach is that the interaction between the

[6] A more detailed survey can be found in Hein and Vogel (2008a).

variables can be incorporated. The disadvantage of the VAR is that it is difficult to identify effects of individual variables.

The second group of papers analyses the goods market in isolation and estimates consumption, investment and net export equations. This is also the approach pursued in this paper. The first paper along these lines was Bowles and Boyer (1995). While the paper has become a seminal reference point for later research, the econometric methods employed are not up-to-date. In particular, they fail to discuss the time series properties of the economic variables and ignore the issue of unit roots. As a consequence, they do not apply difference or error correction models that form the core of modern time series econometrics. To identify international trade effects they estimate net exports (in percent of GDP) as a function of the profit share and a demand variable. Hein and Vogel (2008a) estimate a model for Austria, France, Germany, the Netherlands, UK and the USA, that is essentially identical to our approach with regard to the treatment of consumption and investment, but follows Bowles and Boyer (1995) in their treatment of international trade.[7] This approach implicitly assumes that a one percentage point increase in the wage share has the same effect on net exports (in % of GDP) at export shares of 10% and at 40%. It therefore cannot adequately capture the effects of globalization.

Naastepad and Storm (2006/2007) estimate a similar model for eight OECD countries. The estimated model is strictly derived from the theoretical one. Consequently the estimated equations are typically in ratio form, which are not the ones favored by modern time series econometrics. With regard to net exports they estimate an export function with world trade and relative unit labor costs (all in logarithmic growth rates) and assume that imports grow with GDP. They find that the effects on consumption and investment are much higher than

[7] Hein and Vogel (2008b) estimate a similar model for Germany and France and then conduct some simulation exercises in order to capture interactions between the demand aggregates, for instance accelerator effects on investment.

those on net exports. They also do not evaluate the net export effects at different degrees of international trade.

Ederer and Stockhammer (2007) for France and Stockhammer, Onaran and Ederer (2007) for the Euro area take a similar approach. They estimate separate price equations and import and export equations, which allows to trace the effects of changes in distribution through prices to exports and imports. Because of this procedure increasing import and export shares play a role even with constant import and export elasticities. Thus one aspect of globalization is taken into account. The present paper builds on this approach but offers a richer treatment of globalization.

While the important role of international trade was recognized early on in the development in Post Kaleckian models (Blecker 1989, Bhaduri and Marglin 1990), most empirical studies have not paid much attention to globalization. This is surprising given the importance of this issue for an egalitarian Keynesian policy strategy. The existing studies also find very small effects of international trade. In Naastepad and Storm (2006/07) the trade effects are much smaller than the consumption and investment effects. They find that a 1%-point increase of real wage growth in Germany leads to a reduction of net exports by 0.13%-points of GDP. Hein and Vogel (2008a) find no statistically significant effect of the wage share on net exports for Germany (and the majority of countries they investigate), while Hein and Vogel (2008b) find a major effect with a somewhat different estimation approach.

The contribution of this paper lies in the treatment of international trade. Globalization has had several effects on how changes in functional income distribution affect aggregate demand. Imports and exports have grown relative to GDP, which presumably has also lead to changes in wage formation as imported inputs have gained more prominence. Moreover price elasticities for imports and exports may have changed. And, because of an increase in outsourcing the import content of exports goods has increased. Finally, investment expenditures may have become more sensitive to profitability.

4. Empirical results

The model is estimated by means of separate single equations for consumption, investment, exports and imports. We use annual data for the period 1970-2005 which are all taken from the OECD Economic Outlook database (downloaded in June 2007). C, I, X, M, Y, W and R are real consumption expenditures, investment expenditures, exports, imports, GDP, wages and profits respectively. Wages and profits were deflated with the GDP deflator. Variable definitions can be found in the Appendix (Table A.1). Unit root tests (reported in Table A.2) confirm that most of our variables are integrated of degree one.[8] The econometric specifications are following the standard practice in modern econometric modelling. Thus, error correction models (ECM) or difference specifications will be applied.

There is a major qualification of the results to be reported. Functional income distribution is assumed to be exogenous, which is obviously not the case. Demand will affect functional income distribution in at least two ways. First, mark-ups typically vary pro-cyclically (e.g. if mark-ups are set on unit labor costs at normal capacity utilization). Second, unemployment will typically (though usually with a time lag) have a negative affect on the wage share. Endogenizing income distribution nevertheless would require a different modelling strategy such as the structural VAR approach of Stockhammer and Onaran (2004).

[8] For ULC, Pm, and Px the ADF tests failed to reject the null hypothesis that they are I(0). However, results are very sensitive to the lag length applied. Visual inspection clearly suggests that they are not stationary. As the low power of unit root test is well known, these variables are treated as I(1).

4.1 Consumption

Consumption is estimated as a function of income. To allow for the effect of a change in distribution on aggregate demand we split the exogenous variable into wage income and profit income. According to the Kaleckian growth model we expect the marginal consumption propensity with respect to wages to be significantly higher than that of profits.

Table 1 reports the results of the estimations. The cointegration test identified no evidence of a long-run relationship between the variables; hence the consumption function was estimated in differences, as in Hein and Vogel (2008a, 2008b). For econometric reasons the variables enter the estimation in logarithmic form.

Insert Table 1

The first equation is a basic difference specification. The consumption elasticity for wages and profits are statistically significant at the 1% level and have values of 0.54 and 0.12, respectively. Since the coefficients are elasticities they have to be converted into marginal effects by multiplying them with the share of consumption in wages and profits respectively.[9] Using the average values over the whole period for C/W and C/R this yields marginal propensities to consume of 0.58 for wage income and 0.20 for profit income. The difference of these two values (0.38) is the effect of a change in function income distribution on consumption[10]. Using the ratios at 1970 and 2005 values, the consumption differential increased from 0.39 to 0.44 during the observed period because of the decline in the wage share.

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[9] $\frac{\partial C}{\partial W} = e_{CW}\frac{C}{W}$, where e_{CW} is the elasticity of consumption with respect to wages

[10] In order to control for robustness we added a difference specification with the restriction that the coefficients of wages and profits add up to one and a model in shares; the consumption differential of 0.30 and 0.34, respectively, support the first result (see Table A.3 in the appendix).

The results are in line with the reported differential of the elasticities of 0.39 for Germany in Naastepad and Storm (2007). Furthermore, estimating the same specification as we do, Hein and Vogel (2008a) show only a slightly lower magnitude of the differential (0.32), whereas in Hein and Vogel (2008b) it is a bit higher (0.42). Minor differences are probably due the use of different data source (the AMECO data set), estimation periods and deflation procedures.

In the investigation of the effects of globalization estimations will frequently be performed for sub-samples. The samples will be split into a first subperiod 1970-1987 and a second one 1988-2006. The year 1987 lies exactly in the middle of our full sample and thus guarantees that both sub-samples have the same (modest) numbers of observations. These sub-periods will also be used for the other behavioral equations. While the exact choice of the year is arbitrary, experimentation indicated that the precise year makes little difference for the results. The tests for the consumption function are performed for consistency as we have no a priori expectation that globalization has influenced the consumption differential. Although no evidence of a break point according to the Chow test was found, the parameter estimates differ substantially for the periods 1970 to 1987 and 1987 to 2005. Sub-period 1 shows a consumption differential of 0.31, sub-period 2 shows a considerably higher, though not statistically significant different consumption differential of 0.53.[11] The increase of the differential is not easily explicable. One reason might be the reduction of real unit labor costs and hence the wage share since the midst of the 1980s which could have led to a reduction of the propensity to save out of wage income. However, the decline cannot explain all of the change. German unification as a factor was tested by including a shift-dummy from 1991 to 2005, but it was not statistically significant. While the results for the entire sample are clear, those for the subperiods have to be interpreted with caution because of the statistical rejection of the break point.

[11] To compute the partial effects the average values of C/W and C/R of each sub-period were used.

4.2 Investment

Investment is estimated as a function of (the log of) GDP, (the log of) profits and the real interest rate. The coefficient estimate on profits will give the effect of an increase in profits given the level of income (and the interest rate) and therefore corresponds to the effect of a change in the profit share. Investment may also have been affected by globalization; therefore the estimation will also be performed for sub-samples to investigate whether changes in the investment functions have occurred. In particular, we hypothesize that the profit sensitivity of investment may have increased, because globalization made it easier for firms to move production (and hence investment) abroad if this promises higher profits. OECD (2007) presents evidence that labor demand has become more elastic with respect to real wages since 1980. Presumably, this means that investment also has become more elastic with respect to wages and profits. Indeed Hatzius (2000) presents evidence for British and German manufacturing industries that FDI as well as domestic investment have become more elastic with respect to unit labor costs.

Table 2.1 reports the results of the estimations. The first equation is a difference specification with an auto-regression process of first order to handle autocorrelation problems. The coefficient of the GDP-variable and the long-term real interest rate are significant at the 1% level and the 5% level and in addition have the expected signs and magnitudes. The elasticity of profits with a value of -0.02 is neither statistically significant, nor economically plausible. Two other specifications were estimated in order to check the robustness of this result. In the difference specification with lagged explanatory variables the elasticity of profits remains statistically insignificant but turns positive (0.62). The estimated error-correction model shows a significant short-run relation between profits and investment, however, the specification is not applicable because of the small and insignificant value of the error

correction term. The estimations results for sub-periods in differences are of a similar nature; here the elasticity of profits is statistically insignificant and negative.

Insert Table 2

While the results may appear surprising at first, they are in line with those of Hein and Vogel (2008a) who report negative and statistically insignificant effects of the profit share on the log of investment and Hein and Vogel (2008b) who obtain slightly positive but also insignificant effects of the profit share on the share of investment in GDP. However, Naastepad and Storm (2007) estimate the log of the investment share in GDP as a function of the log of GDP and (the log of) the profit share and find a high effect, with an elasticity of 0.56. They use lagged values of the explanatory variables and include no long-term interest rate variable and do include a time trend. It is not obvious what explains this difference. Hatzius (2000) uses a panel of manufacturing industries, which may explain the differences in his results compared to ours. Based on OECD national account data, the lack of an effect of profits on investments is robust and, hence, will be treated as zero.

4.3 Prices

This paper analyses the demand effects of a change in the wage share. While it does not matter for the effects on consumption and investment expenditures whether an increase (or decrease) in the wage share comes with effects on the price level, it does matter for net exports, because exports and imports will depend on the domestic price level relative to the international price level (assuming that the nominal exchange rate is stable). Therefore the price effects of changes in income distribution have to be analyzed in order to understand the effects on international trade.

As wage negotiations are in nominal terms (though obviously both sides of the negotiations aim at real magnitudes) the starting point of the analysis is a change in *nominal* unit labor costs (ULC).[12] The question is how the change in ULC affects domestic prices (and as a consequence *real* unit labor costs (RULC) and how it affects export prices. These two questions are distinct because export goods have a much higher share of manufacturing goods than overall GDP, which consists to a large part of services that are not internationally traded. Manufacturing goods are typically more capital intensive than services; consequently there are important differences in the corresponding price equations.

Table 3 summarizes the price equations for domestic (GDP-deflator) and export prices. The logs of both price deflators are explained by the log of nominal unit labor costs and the log of import prices. In both cases the equation was estimated in difference form, because there was no evidence of cointegration.

Globalization has been one of the important developments in the period under investigation. As international trade has increased one might expect changes in the relative effects of ULC and import prices in the price equations. To check this effect a Chow breakpoint test with the year 1987 was performed. For both equations the Chow breakpoint test is suggestive but ultimately inconclusive of the presence of a structural break, as the relevant test fails at conventional levels of statistical significance. In the case of the domestic price equation the F tests failed to reject the null of no break just above the 5% level, for export prices the Chow test was statistically significant just above the 10% level.

Insert Table 3

As can be seen in Table 3, the coefficient estimates in the price equation have the expected (positive) signs and are statistically significant at the 1% level in all three samples. The

[12] Note that a change in nominal unit labor costs can also occur because of a technology shock.

coefficient estimate for ULC is 0.42 in the full sample and falls from 0.52 in the first sub-sample (1970-1987) to 0.29 in the second sub-sample (1987-2005). All three equations include a correction for first order autocorrelation. The existence of autocorrelation may indicate missing variables; however it is not obvious what these might be.

As (the log of) real unit labor costs equals (the log of) nominal unit labor costs minus the (log of) the price level, the results of the price equation allow for the calculation of the effect of a change in ULC on RULC. The price equation is estimated as $\ln P = b_1 \ln ULC + b_2 \ln P_M + \varepsilon_t$, thus $\frac{\partial \ln P}{\partial \ln RULC} = \frac{b_1}{1 - b_1}$.[13] In the full sample an increase in ULC by 1% will increase prices by 0.42% and RULC by 0.58%. This implies that in order for RULC to change by 1%, a change of ULC of 1.72% is required (in the full sample). Consequently an increase of RULC by 1% will come with an increase in inflation of 0.72% (based on the parameters of the full sample). In the first sub-sample the value was 1.1% and 0.4% in the second sub-sample. This may be a result of the increased openness of the German economy which limits the firms' capacities to pass on nominal unit labor cost hikes to prices (the GDP deflator in this case).

Table 3.2 summarizes the results for export prices. Again coefficients have the expected signs and are statistically significant. The coefficient estimates for import prices (PM) are substantially larger than in the estimations for domestic prices and the estimates for ULC are somewhat smaller. The elasticity of export prices with respect to ULC is 0.37 in the full sample and falls from 0.37 in the first sub-sample to 0.21 in the second sub-sample. In the full

[13] Note that $RULC = \Omega = ULC / P$. Alternatively one can estimate real ULC as a function of nominal unit labor costs and import prices directly. The results of this equation are: $\Delta \ln RULC = -0.01 + 0.58\, \Delta \ln RULC - 0.07\, \Delta \ln P_M$, where an AR(1) correction has been applied and all coefficient estimates were statistically significant at the 1%-level.

sample an increase in RULC by 1% comes with an increase of export prices by 0.63, in the first sub-sample by 0.78 and in the second sub-sample by 0.30.[14]

Overall we find some evidence for changes in the formation of GDP prices and export prices between the 1970-87 and the 1987-2005 periods. However, the Chow breakpoint tests fail to indicate a break at the conventional 5% level. The changes in the coefficient estimates do correspond to our expectations regarding the changes caused by globalization. However, we cannot exclude that other factors are responsible as well. The most obvious candidate, a shift in sector composition, would work in the opposite direction. As services increased at the expense of manufacturing, one would expect an increase in the elasticity of prices with respect to ULC, because services are typically more labor intensive than manufacturing goods and they are less exposed to international competition. While we therefore cannot exclude that other factors are also at work, it seems plausible that most of these changes are due to globalization.

4.4 Net exports

Exports are a function of real GDP growth of trading partners (YW), of the exchange rate and of export prices (PX) relative to import prices (PM). Imports are a function of real domestic GDP and of export prices relative to import prices. As imports have to be tradable goods and services, the export price deflator is used for the domestic price level. While this is an imperfect measure for the goods and services competing with imports, it is a better measure than the GDP deflator, which contains a large share of non-tradables. YW has been calculated

[14] The elasticity of export prices with respect to real unit labor is $e_{PxULC}e_{ULC\Omega}$. The respective values can also be read from Table 7.

as trade weighted growth rates of real GDP of the ten most important trade partners, with trade weights for the pre-1990 and the post-1990 periods.[15]

Again we investigate whether there have been changes in the relevant parameters due to globalization. In particular the catching up of many emerging markets and the removal of trade barriers ought to have affected the price elasticities of exports and imports through increased competitive pressures. Therefore the estimations are, again, performed for the first and the second half of our sample separately.

Table 4.1 summarizes the results for the export equation. The coefficient estimates have the expected signs and with the exception of the second sub-sample are statistically significant at the 5% level or better. The coefficient estimate for relative prices is -0.78 in the full sample and increases (in absolute value) from -0.67 (in the first sub-sample) to -1.24 (in the second sub-sample).

Insert Table 4

Table 4.2 presents the results for the import equation. Overall the import equation does not perform very well.[16] Unit labor costs were lagged one period because the contemporaneous variable had perverse signs. The lagged variable has the predicted sign, however, it is not statistically significant at conventional levels in the full sample and the first sub-sample. In the second sub-sample it is statistically significant only at the 10% level. The coefficient

[15] Germany's main trading partners are: France, USA Great Britain, Italy, Netherlands Belgium, Austria, Switzerland, Spain, Poland, Sweden, Japan, China Czech Republic and Denmark. The weights were computed with the mean shares of exports and imports for two different periods 1969 to 1989 and 1989 to 2005, using trade data from 1969, 1979, 1989 1991, 1994, 1997, 2002 and 2005.

[16] Stephan (2007) suggests breaking up the demand variable into its components and finds effects for only investment, exports and relative prices in a cointegration relation. Such an approach may be attractive for forecasting, however, theoretically it is hard to motivate that consumption and government expenditures have no effect on imports. Empirically we were unable to replicate Stephan's findings with our data. In particular relative prices tended to have a perverse sign in the cointegration relationship.

estimates are economically modest, but meaningful. In the full sample the elasticity of imports with respect to ULC is 0.12. In the first sub-period it is 0.24, which increases to 0.31 in the second sub-sample.

The results thus are overall in line with our expectations, however in the case of imports, they lack statistical significance. The price elasticity of exports increased substantially from the first to the second sub-period; the price elasticity of imports increased moderately. Again, we cannot be sure that all of this change can be attributed to the effects of globalization, though again it is plausible that globalization is the driving force behind them.

The total effects of a change in functional income distribution on net exports result from a long causal chain that goes from real unit labor costs via nominal unit labor and export prices to exports and imports. For the effect on exports the relevant equation is:

$$\frac{\partial X/Y}{\partial \Omega} = e_{XP_x} e_{P_x ULC} e_{ULC.\Omega} \frac{X}{Y} \frac{1}{\Omega}, \qquad (5)$$

where e denotes an elasticity.

Equation (5) already transforms elasticities into marginal effects and normalizes the results with respect to GDP. The results can be readily interpreted as the effects of a 1% point increase in the wage share on exports relative to GDP, because RULC is equal to the wage share in our data set. The respective formula for imports is analogous. To derive the total effect on net exports the effects on exports and on imports have to be added up taking into account the import content of exports (which was summarized in equation 3).

The increase in international trade is an important aspect of globalization that is reflected in increasing import and export shares. Therefore it makes a big difference at which point in time the elasticities are converted into marginal effects, which is subject of the following section.

4.5 Effects of globalization

We are now in a position to conclude our findings on the effect of the change in the wage share on net exports. The paper has set out to identify three effects of globalization: rising levels of export shares and import shares, the import intensity of exports and changes in the parameters in the price equations, the import and the export equation. It turns out that it is difficult to conclude by calculating a single value for the effect.

First, there has been a substantial increase in export shares and import shares. Exports have risen from 16% of GDP in 1970 to 45% in 2006 (see Appendix Table A.4). The rise of imports is comparable. With a given price elasticity the same change in the wage share will thus have a different demand effects on GDP.

Second, globalization has not only increased the export and imports of final goods, but also of intermediate goods, that is, there has been an increase in outsourcing. This poses a conceptual problem here. Unlike consumption and investment expenditures, import and exports are not a value added magnitude but a measure of gross production value. They include the value of intermediate goods. An increase in the globalization of production will thus inflate imports (and exports) relative to GDP because more intermediaries are imported. If we calculate the effects of price changes on exports and imports, the result will be misleading. Therefore it is necessary to correct for the increasing import content of exports. An increasing import content of exports will, ceteris paribus, reduce net exports, the variable we are interested in, and might hence spoil our estimation results for the effects of changes in income distribution on net exports. In order to correct for this effect we use the data from input-output tables summarized in Table 5. Neipp (1980) calculates that in 1970 the import content of German exports was 22%, whereas in 2000 the import content of German exports

was calculated to be 38% (Brautzsch and Ludwig 2005). The import content is used as a proxy for the marginal effect of exports on import ($\frac{\partial M}{\partial X}$ in equation 3).

Insert Table 5

Table 6 summarizes our results for these first two effects. The calculations are performed based on equations (3) and (5). They evaluate the marginal effects of an increase in the wage share by 1 %-point for imports and exports in three variants at export and import shares for 1970, the sample mean and 2005 respectively. These scenarios are based on the coefficient estimates for the full sample (1960-2005). In 1970 the export and import share were 16% and 18% respectively and the import content of exports is 22%. With these values an increase in the wage share by one percentage point decreases net exports by 0.08 % of GDP (Table 6.1). At the sample mean the effect on net exports increased to -0.1% of GDP (Table 6.2). In 2005 the export and import share were 41% and 35% respectively and the import content of exports is 38%. With these values an increase in the wage share by one percentage point decreases net exports by 0.17 % of GDP (Table 6.3). Thus the increase in international trade has almost doubled the negative effect of a change in the wage share on net exports.

Insert Table 6

Thirdly, while the effects discussed so far are relatively clear cut, the effects of an increase in international competition on the price equation, the export price equation, the export equation and the import equation are more elusive. Often statistical significance and economic significance (McCloskey and Ziliak 1996) do not coincide. Table 7.1 summarizes the test statistics for the Chow test of a break in 1987, which is exactly at the middle of our

sample, as well as of the relevant parameter estimates. Only one equation, the import equation exhibits statistical evidence of a structural break at the 5% level. However, there are two problems with this equation. First the change in the relevant parameter is economically modest. Second, there is an inconsistency in the results: the parameter estimate for the total sample is below the parameter estimate for either sub-sample, which logically makes little sense.

The price equation shows a break that is statistically significant at the 10% level, however the change in the parameter estimate is economically substantial as the parameter value is almost halved. Finally, the Chow test unambiguously fails to reject the null that there is no structural break in the export function, however the parameter estimates for the two subsamples differ dramatically. According to the estimates, the price elasticity of exports doubled.

Insert Table 7

We conclude the following from the analysis of the sub-samples. It seems that our sub-samples are too small to give precise estimates. The changes in the relevant behavioral functions are economically substantial and the parameter change in the expected direction. The elasticity of domestic prices and export prices with respect to unit labor costs decreases and the price elasticities of exports and imports increase. However, Chow tests do not confirm that there has been a statistical break in the behavioral function. For all but one equation the null hypothesis of no break is not rejected (at the 10% level). Moreover, the economically relevant parameter changes do not coincide with statistically significant Chow tests. The strongest parameter change is in the export equation, where there is no evidence of a break. We will thus not utilize the coefficients from the sub-sample estimates for the final calculations.

While not statistically significant, many of the changes of the parameter estimates for our sub-samples are economically significant in the sense that the parameter changes can make a substantial difference in the calculations. As all parameters change in the expected direction, it seems unwise to completely discard this information. Tables 7.2 and 7.3 thus summarize calculations for the two sub-samples to give the reader a better understanding of how the statistically unreliable parameter changes would affect the total outcome. These calculations have to be interpreted with caution and should only be interpreted as indicative of the direction of change. Note that the changes in price equation and the changes in the import and export equation work in different directions. While the ULC play a smaller role in price determination in the second sample, exports and imports have become more sensitive to price changes. Surprisingly, it turns out that the changes almost cancel each other out. The overall change in net exports caused by a change in the wage share is, for practical purposes, almost identical in the first sub-sample and the second sub-sample. The elasticity or exports and imports with respect to real unit labor costs has decreased, despite the fact that the elasticity with respect to export prices has increased because prices have become less responsive to unit labor costs. Because of an increase in exports and import shares the overall effects are very similar. While there seem to have been several changes in the behavioral functions, we have little evidence that the overall effect has changed.

Finally remember that the hypothesis that investment may have become more sensitive to profitability because of the increase in capital mobility was investigated above (Table 2). No effect of profits on investment was found, neither in the full sample nor in the sub-samples. This absence of profit effect is robust to changes in specifications.

4.6 Total effects

To illustrate the total effects and their changes over time, Table 8 puts together the partial results presented above evaluated for respective demand shares in GDP at the beginning (1970), the mean and the end (2005) of our sample. The positive effect of an increase in the wage share by one percentage point on private consumption is 0.39 %-points of GDP in 1970, 0.38 %-points at mean values and 0.44 %-points in 2005. As the wage share rises mildly from 1970 to the sample mean, the consumption differential increases slightly. The wage share sharply declines afterwards, which widens the consumption differential (with given consumption elasticities). We failed to find evidence that profits affect investment expenditures in Germany. The relevant coefficients were statistically insignificant and frequently showed perverse effects. Therefore the investment effects are excluded and the *domestic sector* of the economy is thus clearly wage led.

Insert Table 8

The effects of changes in the wage share on net exports have already been extensively discussed in the previous section. Table 8 restates the effects from Table 6.1 to 6.3. A 1%-point change in the wage share led to decrease of net exports by 0.13% of GDP in 1970. By 2005 this effect has doubled to 0.27%. At the sample mean the value is in between at 0.17%. These values result from a dynamic increase in international trade. Despite this tremendous increase in the effect on net exports, the effect is still substantially smaller than the effect on consumption. Private excess demand is clearly wage-led, though the actual value decreases over time. A 1%-point increase in the wage share led to an increase in private excess demand by 0.27%-points of GDP in 1970 and to 0.17 %-point in 2005.

To get the total private effects of a change in income distribution on *equilibrium demand* excess demand has to be multiplied by the multiplier of equation 4, that is $\frac{1}{1-h_1}$. As these would have to be interpreted as general equilibrium effects we abstain from this exercise because the exogeneity assumptions outlined in section 2 seem rather strong in this context.[17] Moreover, the results would be sensitive to the specific parameters applied. h_1 consists of the partial effects of changes in income on consumption, investment and imports. As our equations describe short-run effects the accelerator term would be difficult to interpret.

The qualitative result of this study is thus clear: wage moderation will overall have negative effects on (private) aggregate demand in Germany. A plausible, conservative point estimate of the total effect is 0.17 % points of GDP. Globalization has had substantial effects on how changes in the income distribution affect aggregate demand, but these effects have not been sufficient to undermine the wage-led demand regime in Germany.

5. Conclusion

Globalization has various effects on how distribution affects aggregate demand. These effects often work in opposite directions. The increase in international trade increases the absolute value of the effect of an increase in the wage share on net exports. Measured export and import shares overstate this effect because outsourcing has increased the import content of exports, and hence net exports. Exports and imports have become more price elastic, presumably due to increased international competition. However, increased competitive pressures also decrease the effect that a change in nominal unit labor costs has on prices. Finally, increased capital mobility may have made investment more sensitive to profitability.

[17] Note that the private excess demand effects discussed above are by definition partial (and disequilibrium effects). Here, however, the effects are general equilibrium effects. The assumption that other control variables are exogenous with respect to income and income distribution is therefore much more restrictive.

This paper has contributed to the analysis and identification of these effects. Germany is a particularly interesting case because it is a large open economy that has an export-oriented industry. It has also experienced a drastic form of nominal and real wage moderation.

Some econometric evidence was found for all the effects listed above with the exception of changes in the investment function. However, often the changes in the behavioral functions are suggestive rather than conclusive. In the analysis of price formation and price elasticities of exports and imports the changes in parameters confirm the expected changes due to globalization, but not at conventional levels of statistical significance. However these changes seem to be offsetting each other. The single biggest effect from globalization comes from the increase in international trade (even once this is corrected for the increased import content of exports).

The effects of increased trade are substantial and relevant. However, in the case of Germany they are not large enough to switch the demand regime that remains wage led. This finding is consistent with the fact that the German economy has underperformed the rest of the EU and the EMU for a considerable period of time now (Hein and Truger 2005, 2007). This finding has interesting policy implications. The constraints on domestic wage policy do not seem to be as big as sometimes thought because the different effects of globalization work in opposite directions. However, this does not mean that globalization doesn't have to be taken seriously. It does affect the demand regime and, presumably, many small economies will exhibit profit-led demand regimes because of globalization.[18]

There are several limitations of the approach taken here that should be addressed by future research. An important part of the analysis of the effects of globalization operated through investigating whether changes in key behavioral functions have occurred. This strategy is limited on two dimensions. First, it runs up against decreasing degrees of freedom.

[18] See the results in Hein and Vogel (2008a) and in Stockhammer and Ederer (2007) for Austria and the Netherlands.

Consequently the estimates lack precision and statistical reliability. This problem could be addressed by means of panel analysis of countries. Second, globalization itself does not enter as explanatory variable. To address this issue one would need a proxy for competitive pressure that is linked to globalization.

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Tables

Table 1: Regression results for consumption equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		**1970 - 1987**		**1987 - 2005**	
Dep. Variable:	ΔIn C		ΔIn C		ΔIn C	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	0,008	2,535 **	0,011	1,528	0,008	3,140 ***
Δ ln W	0,540	6,198 ***	0,482	2,855 **	0,609	7,474 ***
Δ ln R	0,119	1,389	0,113	0,630	0,087	1,308
Adj, R^2	0,565		0,377		0,793	
DW stat.	1,889		1,710		2,179	
Chow-Test (1987)	prob. 0.513	F: 0.681				
Marginal Effects (at **1970** values):						
∂C/∂W	0,58					
∂C/∂R	0,19					
∂(C/Y)/∂Ω	0,39					
Marginal Effects (at **sample** means):						
∂C/∂W	0,58		0,50		0,67	
∂C/∂R	0,20		0,19		0,14	
∂(C/Y)/∂Ω	0,38		0,31		0,53	
Marginal Effects (at **2005** values):						
∂C/∂W	0,62					
∂C/∂R	0,18					
∂(C/Y)/∂Ω	0,44					

Notes: C, W, R are real consumption, wages and profits respectively.
Chow-Test null hypothesis: there is no structural change in 1987.
∂C/∂W, ∂C/∂R, ∂(C/Y)/∂Ω are marginal effects of consumption in response to changes of wages, profits and the wage share, respectively. The effect of a change in the wage share is calculated as the percentage increase of consumption relative to total GDP. For the full sample marginal effects are calculated at 1970 values, at the mean of the sample and at 2005 values. For the subsamples marginal effects are calculated at the mean of the subsamples.

Table 2.1: Regression results for investment equation

	DIFF		DIFF in lags		ECM	
Dep. Variable:	Δln I		Δln I		Δln I	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	-0,037	-3,031 ***	0,003	0,168	-1,901	-2,063 **
Δ ln Y	2,453	4,629 ***	-0,273	-0,299	2,986	5,733 ***
Δ ln R	-0,017	-0,053	0,621	1,391	0,577	2,273 **
Δ i	-0,016	-2,189 **	-0,019	-1,932 *	-0,328	-1,086
ln Y(-1)					-0,261	-1,126
ln R (-1)					-0,231	-2,361 **
i (-1)					-0,010	-1,409
ln I(-1)					-0,003	-0,705
AR(1)	0,407	2,133 **	0,359	1,472		
Adj, R^2	0,652		0,339		0,750	
DW stat.	1,994		1,652		1,701	

Notes: I, Y, R and i are real business investment, real GDP, profits and the interest rate respectively.
AR(1) indicates that a correction for first-order autocorrelation has been included.
In specification "DIFF in lags" all explanatory variables are lagged one period.

Table 2.2: Regression results for investment equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		**1970 - 1987**		**1987 - 2005**	
Dep. Variable:	Δln I		Δln I		Δln I	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	-0,037	-3,031 ***	-0,042	-1,560	-0,023	-1,797 *
Δ ln Y	2,453	4,629 ***	2,635	2,898 **	2,342	3,966 ***
Δ ln R	-0,017	-0,053	-0,194	-0,331	-0,134	-0,448
Δ i	-0,016	-2,189 **	-0,024	-2,137 *	-0,001	-0,115
AR(1)	0,407	2,133 **	0,592	1,991 *	0,150	0,502
Adj, R^2	0,652		0,641		0,758	
DW stat.	1,994		1,898		1,883	
Chow-Test (1987)	prob. 0.391	F: 1.092	1,898		1,883	
Marginal Effects (at 1970 values):						
∂I/∂R	-0,01					
Marginal Effects (at mean values):						
∂I/∂R	-0,01		-0,10		-0,07	
Marginal Effects (at 2005 values):						
∂I/∂R	-0,01					

Notes: I, Y, R and i are real business investment, real GDP, profits and the interest rate respectively.
AR(1) indicates that a correction for first-order autocorrelation has been included.

Table 3.1: Regression results for price equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		1970 - 1987		1987 - 2005	
Dep. Variable:	ΔIn P		ΔIn P		ΔIn P	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	0,015	4,105 ***	0,014	4,453 ***	0,012	1,463
Δ ln ULC	0,420	6,219 ***	0,524	7,651 ***	0,286	3,129 ***
Δ ln PM(-1)	0,072	3,649 ***	0,075	3,410 ***	0,112	3,973 ***
AR(1)	0,674	4,711 ***	0,071	0,210	0,822	5,618 ***
Adj, R^2	0,897		0,904		0,835	
DW stat.	1,758		1,642		1,628	
Chow-Test (1987)	prob. 0.057	F: 2.643				

Table 3.2: Regression results export price equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		1970 - 1987		1987 - 2005	
Dep. Variable:	ΔIn Px		ΔIn Px		ΔIn Px	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	0,003	1,124	0,008	0,981	0,001	0,780
Δ ln ULC	0,368	4,270 ***	0,370	1,923 *	0,213	2,648 **
Δ ln PM	0,375	11,051 ***	0,355	6,305 ***	0,380	7,158 ***
AR(1)	0,320	1,780 *	0,189	0,563	0,054	0,301
Adj, R^2	0,904		0,896		0,793	
DW stat.	1,836		1,753		1,882	
Chow-Test (1987)	prob. 0.110	F: 2.098				

Notes: P, PM, PX and ULC are GDP-prices, import prices, export prices and unit labor costs respectively.

Table 4.1: Regression results export equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		1970 - 1987		1987 - 2005	
Dep. Variable:	Δln X		Δln X		Δln X	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	0.004	0.333	0.001	0.082	0.021	0.759
Δ ln YW	2.017	4.469 ***	1.750	3.815 ***	1.652	1.622
Δ ln Px/Pm	-0.779	-4.491 ***	-0.666	-3.774 ***	-1.245	-2.924 **
AR(1)	0.245	1.245	-0.111	-0.296	0.086	0.335
Adj, R^2	0.646		0.777		0.605	
DW stat.	1.810		2.085		1.726	
Chow-Test (1987)	prob. 0.522	F: 0.823				

Table 4.2: Regression results import equation, full sample, subsample 1970-1987, subsample 1987-2005

	1970 - 2005		1970 - 1987		1987 - 2005	
Dep. Variable:	Δln M		Δln M		Δln M	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**
c	0.013	1.316	0.015	1.109	0.009	0.369
Δ ln Y	1.707	5.339 ***	1.059	2.020 *	2.756	6.876 ***
Δ ln Px/Pm(t-1)	0.121	0.848	0.237	1.450	0.307	1.923 *
AR(1)	0.400	2.251 **	0.196	0.526	0.732	4.005 ***
Adj, R^2	0.587		0.626		0.717	
DW stat.	1.781		1.669		2.201	
Chow-Test (1987)	prob. 0.042	F: 2.913	1.669		2.201	

Notes: X, M, Y and PX are real exports, real imports, real GDP and export prices respectively.
YW is a trade-weighted measure of the GDP of the main trading partners.

Table 5: Import content of exports in Germany, from 1962 to 2000

year	*import content*	*source*
1962	0,19	Stäglin and Wessels (1973)
1966	0,21	Stäglin and Wessels (1973)
1970	0,22	Neipp (1980)
1980	0,25	Brautzsch and Ludwig (2005)
1985	0,26	Brautzsch and Ludwig (2005)
1991	0,26	Brautzsch and Ludwig (2005)
1995	0,30	Brautzsch and Ludwig (2005)
2000	0,38	Brautzsch and Ludwig (2005)

Table 6.1: Effect chain of a causal in real unit labor costs on net exports at 1970 values

	1	2	3	*4*	5	6	*7*	8
	$e_{ULC\Omega}$	e_{PxULC}	e_{XPx} e_{MPx}	$e_{X\Omega}$ $e_{M\Omega}$	1/Ω	X/Y M/Y	import content	*(∂NX/Y)/∂Ω*
Exports	1,72	0,37	-0,78	*-0,49*	1,69	0,16	0,22	*-0,11*
Imports			0,12	*0,08*		0,18		*0,02*
Sum								*-0,13*

Table 6.2: Effect chain of a causal in real unit labor costs on net exports at mean values

	$e_{ULC\Omega}$	e_{PxULC}	e_{XPx} e_{MPx}	$e_{X\Omega}$ $e_{M\Omega}$	1/Ω	X/Y M/Y	import content	*(∂NX/Y)/∂Ω*
Exports	1,72	0,37	-0,78	*-0,49*	1,64	0,24	0,31	*-0,14*
Imports			0,12	*0,08*		0,25		*0,03*
Sum								*-0,17*

Table 6.3: Effect chain of a causal in real unit labor costs on net exports at 2005 values

	$e_{ULC\Omega}$	e_{PxULC}	e_{XPx} e_{MPx}	$e_{X\Omega}$ $e_{M\Omega}$	1/Ω	X/Y M/Y	import content	*(∂NX/Y)/∂Ω*
Exports	1,72	0,37	-0,78	*-0,49*	1,77	0,41	0,38	*-0,22*
Imports			0,12	*0,08*		0,35		*0,05*
Sum								*-0,27*

Notes: The table summarizes the calculations of equations 3 and 5. Sources for the values used are as follows.
Column 1: eulcrulc is calculated as 1 divided by (1-e_{pulc}) (from Table 3.1). Column 2 estimates from Table 3.2.
Column 3: estimates from Table 4.1 and 4.2 respectively. Column 4: Real unit labor cost elasticities of export and imports calculated by multiplying column 1 values by column 2 values and column 3 values. Column 5 values are computed by 1 divided by the wage share. Column 7 is based on data in Table 5 (and interpolation). Column 8 values are the marginal effects of a one percentage increase in real unit labor costs on net exports. These are calculated by multiplying the respective values in column 4 to 6 for imports and exports. Values for exports are then adjusted for induced imports by multiplying with one minus the import content (column 7; see also equation 3).

Table 7.1: Parameter changes in price, export and import functions

Sample	e_{PULC}	$e_{ULC\Omega}$	e_{PxULC}	e_{XPx}	e_{MPx}	$e_{X\Omega}$	$e_{M\Omega}$
1970-2005	*0,42*	*1,72*	*0,37*	*-0,78*	*0,12*	*-0,49*	0,08
1970-1987	0,52	*2,10*	0,37	-0,67	0,24	*-0,52*	0,18
1987-1990	0,29	*1,40*	0,21	-1,24	0,31	*-0,37*	0,09
Chow break point tests (1987)							
F-stat.	2,64		2,10	0,82	2,91		
prob.	0,06		0,11	0,52	0,04		

Table 7.2: Effect chain of a change in real unit labor costs on net exports, subsample 1970-1987

	$e_{X\Omega}$ / $e_{M\Omega}$	1/Ω	X/Y / M/Y	import content	$(\partial NX/Y)/\partial\Omega$
Exports	*-0,52*	1,60	0,20	0,28	*-0,12*
Imports	*0,18*		0,22		*0,07*
Sum					***-0,19***

Table 7.3: Effect chain of a change in real unit labor costs on net exports, subsample 1987-1970

	$e_{X\Omega}$ / $e_{M\Omega}$	1/Ω	X/Y / M/Y	import content	$(\partial NX/Y)/\partial\Omega$
Exports	*-0,37*	1,68	0,29	0,33	*-0,12*
Imports	*0,09*		0,27		*0,04*
Sum					***-0,16***

Notes: Table 7.1 summarizes the parameter estimates for different subperiods based on the results from tables 3 and 4. Tables 7.2 and 7.3 summarize the calculations of equations 3 and 5 for the two subperiods.

Table 8: Private excess demand (in %-points of GDP) caused by a 1%-point increase of the wage share

	1970	***mean***	***2005***
Consumption	0,39	0,38	0,44
Investment	-	-	-
Net exports	0,13	0,17	0,27
Private excess demand	**0,27**	**0,21**	**0,17**

Notes: Data are taken from Tables 1 (for consumption), 2 (for investment) and 6 (for net exports).

Table A.1: Variable definitions

Notation	OECD Notation	Description
Ω	-	Wage share (identical to real unit labor costs)
C	CPV	Private consumption, real
I	IPV	Private investment, real
i	IRLR	Long-term real interest rate, deflated by GDP deflator
M	MGSV	Imports, real
P	PGDP	GDP deflator
P_M	PMGS	Import price deflator
P_X	PXGS	Export price deflator
R	-	Gross operating surplus, real, deflated by GDP deflator
RULC	-	Real unit labor costs (identical to the wage share)
ULC	ULC	Nominal unit labor costs
W	-	Compensation of employees real, deflated by GDP deflator
X	XGSV	Exports, real
Y	GDPV	GDP, real
YW	-	Trade weighted GDP of main trading partners, real

Table A.2: Unit Root Tests

	Levels			Differences		
Variable	Lags	t-stat.	Significance	Lags	t-stat.	Significance
ln C	1	-1,397	-	0	-2,927	*
ln W	2	-2,367	-	1	-3,667	***
ln R	0	-0,034	-	1	-5,064	***
ln I	1	-0,804	-	0	-3,714	***
ln Y	1	-1,445	-	0	-3,716	***
i	0	-0,804	-	0	-4,505	***
ln M	2	0,741	-	1	-5,067	**
ln X	2	0,750	-	1	-5,322	**
ln ULC	1	-3,105	**	0	-2,562	-
ln RULC	2	0,271	-	1	-3,766	***
ln P	3	-2,414	-	0	-2,445	-
ln Px	1	-3,874	***	0	-3,010	***
ln Pm	1	-3,241	**	0	-3,922	***
ln YW	1	-0,457	-	0	-4,457	***

Note: Critical values according to Charemza and Deadman (1997). *** = statistically signifikant at 1%, ** = statistically significant at 5%, * = statistically significant at 10%. The unit root tests were performed with intercept and without a trend.

Table A.3: Regression results for consumption equation

	DIFF		DIFF + restr		shares		
Dep. Variable:	Δln C		Δln C		Dep. Variable:	C/(W+R)	
Variable	**Coeff.**	**t-stat.**	**Coeff.**	**t-stat.**	**Variable**	**Coeff.**	**t-stat.**
c	0,008	2,535 **	0,001	0,358	C	0,509	4,606 ***
Δ ln W	0,540	6,198 ***	0,702	9,551 ***	R/Y	-0,202	-2,209 **
Δ ln R	0,119	1,389			C(-1)(Y(-1)	0,334	2,257 **
					T92	0,010	2,552 **
Adj, R^2	0,565		0,446		Adj, R^2	0,446	
DW stat.	1,889		2,251		DW stat.	1,775	

Notes:

Table A.4: Change of export and import shares in Germany, from 1970 to 2006

year	X/Y	M/Y
1970	0,16	0,18
1980	0,2	0,25
1990	0,25	0,25
2000	0,33	0,33
2006	0,45	0,4

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