

Distribution and growth in demand and productivity in Switzerland (1950-2010)

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Introduction

- **How do real wage increases affect employment and output?**
 - Neoclassical economists: The aggregate demand curve for labour is downward-sloping so that a real wage increase reduces employment *ceteris paribus*, which also lowers output via the production function.
 - Keynesians: Wages are not only a cost factor, but also a determinant of aggregate demand. Therefore, a rise in real wages might promote employment and output by supporting a higher level of demand.

Introduction

- The latter argument is not straightforward even from a Keynesian perspective, however.
 - A higher wage share in total income probably stimulates the demand for **consumption** goods.
 - It will reduce the demand for **investment** goods, however, if investment is dependent on profits.
 - The demand for **export** goods will fall as well if the rise in real wages impairs the international competitiveness of the economy.
- **Bhaduri and Marglin (1990)** have designed a model in the Kaleckian tradition in which this becomes clear.

Introduction

- Whether or not a rising wage share – in other words, a change in the functional distribution of income in favour of the factor labour – promotes employment and output (growth) thus becomes an **empirical** question.
- If it does, the demand regime is said to be ‘**wage-led**’; otherwise it is called ‘**profit-led**’.

Introduction

- Thus far, the main focus of empirical studies based on the Bhaduri-Marglin model has been on seven countries: Austria, France, Germany, Japan, the Netherlands, the U.K. and the U.S. (see Bowles and Boyer, 1995; Stockhammer and Onaran, 2004; Naastepad, 2006; Naastepad and Storm, 2006-7; Ederer and Stockhammer, 2007; Stockhammer and Ederer, 2008; Hein and Vogel, 2008, 2009; Onaran et al., 2011; Stockhammer et al., 2011).
- From these studies, the broad picture emerges that “the demand regime in large and medium-sized open economies ... tends to be wage-led, whereas for small open economies ... some studies have obtained profit-led results” (Hein and Tarassow, 2010, p. 750).

Introduction

- This paper is the first to study **Switzerland**.
 - Swiss data are available for a much longer time period (1950-2010) than for any country examined so far.
 - This also permits for the first time to include the “Great Recession”.

Introduction

- In terms of modelling I follow **Naastepad (2006)** because her paper exhibits a very close link between the theoretical and the empirical model.
- Also, it has been the only paper apart from Hein and Tarassow (2010) so far to study the **interaction between demand growth and productivity growth**.
- For analysing Swiss productivity growth I use a new time series for labour input compiled by Siegenthaler (2012).

Data

Growth rate of real GDP \hat{x} Growth rate of real GDP excluding goods $\hat{\lambda}$ Growth rate of real GDP excluding goods and services \hat{l} Growth rate of real GDP excluding goods, services and capital \hat{w} Growth rate of real GDP excluding goods, services, capital and infrastructure \hat{v} Growth rate of real GDP excluding goods, services, capital, infrastructure and energy \hat{i} Growth rate of real GDP excluding goods, services, capital, infrastructure, energy and health \hat{e} Growth rate of real GDP excluding goods, services, capital, infrastructure, energy, health and education \hat{z} Profit share v Share of exports π Share of imports ζ Share of exports and imports χ Share of government l Share of government and taxes θ Rate of unemployment u

	\hat{x}	$\hat{\lambda}$	\hat{l}	\hat{w}	\hat{v}	\hat{i}	\hat{e}	\hat{z}	v	π	ζ	χ	l	θ	u
Mean	0.025	0.021	0.005	0.024	0.003	0.032	0.051	0.065	0.549	0.451	0.324	0.347	0.261	1.237	1.163
Median	0.027	0.023	0.004	0.027	0.002	0.041	0.051	0.064	0.564	0.436	0.319	0.348	0.254	1.295	0.266
Max.	0.080	0.074	0.033	0.071	0.049	0.211	0.126	0.145	0.615	0.518	0.444	0.544	0.361	1.598	4.771
Min.	-0.069	-0.026	-0.067	-0.039	-0.036	-0.159	-0.080	-0.144	0.482	0.385	0.218	0.230	0.185	0.929	0.002
Std. Dev.	0.027	0.020	0.016	0.021	0.018	0.067	0.042	0.047	0.045	0.045	0.053	0.080	0.047	0.221	1.534
Obs.	63	60	60	60	62	63	63	61	63	63	64	64	64	63	63

Rate of unemployment

The model

- Demand regime

$$x = c + i + e - m \quad (1)$$

$$c = (1 - \sigma_w) \frac{w}{\lambda} x + (1 - \sigma_\pi) \pi x = [(1 - \sigma_w)v + (1 - \sigma_\pi)(1 - v)]x; \quad \sigma_\pi > \sigma_w \quad (2)$$

$$i = a_i b^{\phi_0} \pi^{\phi_1} x^{\phi_2} \quad \phi_0, \phi_1, \phi_2 > 0 \quad (3)$$

$$e = a_e z^{\varepsilon_0} \left(\frac{v}{v_f} \right)^{\varepsilon_1} \quad \varepsilon_0 > 0; \varepsilon_1 < 0 \quad (4)$$

$$m = \zeta x \quad (5)$$

The model

- Demand regime – transformations

$$x = \frac{i + e}{[\sigma_\pi - v(\sigma_\pi - \sigma_w) + \zeta]} = \frac{1}{\mu}(i + e); \quad \frac{1}{\mu} > 1 \quad (6)$$

$$\hat{x} = -\hat{\mu} + \frac{l}{\mu}\hat{i} + \frac{\chi}{\mu}\hat{e} = -\hat{\mu} + \psi_i\hat{i} + \psi_e\hat{e} \quad (7)$$

$$\hat{\mu} = -\frac{v}{\mu}(\sigma_\pi - \sigma_w)\hat{v} = -\xi(\sigma_\pi - \sigma_w)[\hat{w} - \hat{\lambda}] \quad (8)$$

$$\hat{\pi} = \frac{\Delta\pi}{\pi} = -\frac{\Delta v}{\pi} \frac{v}{v} = -\theta\hat{v} = -\theta(\hat{w} - \hat{\lambda}) \quad (9)$$

$$\hat{x}_{DR} = \frac{\psi_e \varepsilon_0 \hat{z}}{[1 - \psi_i \phi_2]} + C\hat{w} - C\hat{\lambda}; \quad C = \frac{[\xi(\sigma_\pi - \sigma_w) - \psi_i \phi_1 \theta + \psi_e \varepsilon_1]}{[1 - \psi_i \phi_2]} \quad (10)$$

The model

- Productivity regime

$$\hat{\lambda} = \beta_0 + \beta_1 \hat{x} + \beta_2 \hat{w}; \quad \beta_0, \beta_2 > 0; \quad 0 < \beta_1 < 1 \quad (11)$$

$$\hat{x}_{PR} = -\frac{\beta_0}{\beta_1} - \frac{\beta_2}{\beta_1} \hat{w} + \frac{1}{\beta_1} \hat{\lambda} \quad (12)$$

The model

- Equilibrium

$$\hat{x}^* = -\frac{\beta_0 C}{1 + \beta_1 C} + \left[\frac{1}{1 + \beta_1 C} \right] \left[\frac{\psi_e \varepsilon_0}{1 - \psi_i \phi_2} \right] \hat{z} + \left[\frac{(1 - \beta_2) C}{1 + \beta_1 C} \right] \hat{w} \quad (13)$$

$$\hat{\lambda}^* = \frac{\beta_0}{1 + \beta_1 C} + \left[\frac{1}{1 + \beta_1 C} \right] \left[\frac{\psi_e \varepsilon_0}{1 - \psi_i \phi_2} \right] \beta_1 \hat{z} + \left[\frac{\beta_2 + \beta_1 C}{1 + \beta_1 C} \right] \hat{w} \quad (14)$$

Empirical strategy

- First step: Obtain estimates for the model parameters σ_w , σ_π , ϕ_1 , ϕ_2 , ε_0 , ε_1 , β_1 and β_2 in order to determine whether the Swiss demand and productivity regimes are wage-led or profit-led.
- Second step: Calculate the model's prediction for the *change* in demand and productivity growth after the inception of wage moderation in Switzerland at the beginning of the 1990s.
- Third step: Compare these model predictions with the true change in GDP growth and productivity growth after 1990 against the earlier period.

Results

- Results for the demand regime
 - For the estimation of the parameters σ_w and σ_π a transformation is used that goes back to Bowles and Boyer (1995).

$$s_n = (\sigma_w \nu + \sigma_\pi \pi) x_n \quad \Rightarrow$$

$$\sigma = s_n / x_n = \sigma_w + (\sigma_\pi - \sigma_w) \pi$$

- So if we regress the savings rate on a constant and the profit rate, the constant will measure employees' propensity to save and the coefficient on π measures the difference between the profit receivers' and the employees' propensity to save.
 - It is expected that $\sigma_w < \sigma_\pi$.

Results

- Results for the demand regime
 - The investment and exports equations (A.3 and A.4) are transformed into growth rates.

$$\hat{i} = \phi_0 \hat{b} + \phi_1 \hat{\pi} + \phi_2 \hat{x}$$

$$\hat{e} = \varepsilon_0 \hat{z} + \varepsilon_1 \hat{v}$$

- The three equations are estimated with OLS.

Results

■ Results for the demand regime

	σ		\hat{i}		\hat{e}	
	<i>Naastepad (2006)</i>		<i>Naastepad (2006)</i>		<i>Naastepad (2006)</i>	
Const.			-0.019*** (-3.218)	-0.009** (1.88)		
σ_w	0.118* (1.965)	0.140** (2.23)				
π_{-1}	0.429*** (3.114)	0.354** (2.17)				
$\hat{\pi}_{-1}$			0.331 (1.610)	0.392** (2.17)		
\hat{x}			2.086*** (13.062)	1.336*** (4.56)		
\hat{z}					0.756*** (15.976)	0.976*** (18.99)
\hat{v}					-0.551** (-2.180)	-0.188** (1.83)
Adj. R ²	0.887	0.10	0.763	0.36	0.611	0.91
SE	0.010	0.02	0.031	0.01	0.029	2.19
D.W.	1.945	2.24	1.601	1.76	1.714	1.71
Obs.	62	41	62	39	60	40
Period	1950-2011	1960-2000	1950-2011	1960-2000	1951-2010	1960-2000

Notes: Numbers in parentheses below the coefficients are *t*-statistics. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels respectively. SE = standard error. D.W. = Durbin-Watson statistic.

Results

- Results for the demand regime
 - The ‘accelerator’ (the coefficient on GDP growth in the equation explaining investment growth) is stronger in Switzerland than in the Netherlands.
 - So is the (negative) impact of real unit labour cost growth on export growth.
 - The foreign demand elasticity of exports is lower in Switzerland.
 - The main difference is that the coefficient on the profit share in the investment growth equation is insignificant at the 10% level.
 - The coefficient is close-to-significant, however (Prob. = 0.113).
 - Given the measurement problems with macroeconomic data, there may or may not be an impact of redistribution on investment growth in Swiss reality.
 - I will therefore consider both possibilities in the results reported below.

Results

- Results for the demand regime
 - With the estimated coefficients, it is possible to calculate C .
 - Beforehand, it must be decided how to calibrate the ‘shares’ (export share, investment share, wage share etc.) entering the model.
 - Naastepad (2006) evaluates the shares at the sample mean.
 - Stockhammer et al. (2009) report results for both the sample mean and the most up-to-date shares available. I will follow their lead.

Results

Results for the demand regime

Coefficients	σ_w	σ_π	ϕ_1	ϕ_2	ε_0	ε_1
	0.118	0.547	0 or 0.331	2.086	0.756	-0.551
Other parameters	μ^{-1}	ξ	ψ_e	ψ_i	θ	
At mean shares	1.575	0.864	0.547	0.412	1.237	
At up-to-date shares	1.443	0.847	0.736	0.291	1.423	

Effects of an increase in real wage growth by one percentage point on

	Consumption growth	Investment growth	Export growth	Total effect	
	$\frac{[\xi (\sigma_\pi - \sigma_w)]}{[1 - \psi_i \phi_2]}$	$\frac{-[\psi_i \phi_1 \theta]}{[1 - \psi_i \phi_2]}$	$\frac{[\psi_e \varepsilon_1]}{[1 - \psi_i \phi_2]}$	C	
				With investment	Without investment
At mean shares	2.620	0 or -1.194	-2.132	-0.706	0.488
At up-to-date shares	0.924	0 or -0.349	-1.033	-0.458	-0.109

Results

- Results for the demand regime
 - The signs on the partial demand effects are as expected.
 - When calculated with the mean shares, the sign on the total effect depends on whether or not an effect of redistribution on investment growth is assumed.
 - If yes, Swiss demand growth is profit-led, otherwise it is wage-led.
 - In any case, the absolute values for the total effect (-0.706 or 0.488) seem a bit extreme. None of the eight countries analysed by Naastepad and Storm (2006-7) with this model is either that strongly wage-led or profit-led.

Results

- Results for the demand regime
 - When calculated with the up-to-date shares, the redistribution effect on consumption growth and investment growth (assuming there is one) fall well into line with those found for other countries.
 - The effect on export growth, however, is still much stronger in Switzerland because of a high negative impact of real unit labour cost growth on export growth (ε_1).
 - Notably, the total effect is now negative even if we disregard any effects of income redistribution on investment growth.
 - The growing importance of exports for total demand is responsible for this.
 - We can conclude that while the **Swiss demand regime** may have been wage-led in the past, it **is** certainly **profit-led today**.

Results

- Results for the productivity regime
 - The table reports the results from the estimation of the productivity regime equation (11).

	$\hat{\lambda}$	
	<i>Naastepad (2006)</i>	
Const.	-0.003 (-0.65)	-1.014 (1.52)
\hat{x}	0.686*** (7.512)	0.630*** (4.37)
\hat{w}	0.320*** (4.501)	0.520*** (4.40)
Adj. R ²	0.721	0.64
SE	0.010	1.34
D.W.	2.039	1.68
Instrument rank	8	
J-statistic (Prob.)	6.557 (0.161)	
Obs.	59	40
Period	1952-2010	1961-2000

Notes: Numbers in parentheses below the coefficients are *t*-statistics. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels respectively. SE = standard error. D.W. = Durbin-Watson statistic. The J-statistic can be used as a test of over-identifying moment conditions.

Results

- Results for the productivity regime
 - The explanatory variables are significant with the expected signs.
 - Compared to the Netherlands, the Verdoorn effect β_1 (the coefficient on GDP growth) has a similar magnitude in Switzerland while the productivity-enhancing effect of real wage growth (β_2) is weaker.

Results

- Results for the productivity regime
 - With the estimates for β_1 and β_2 , we can now calculate the total impact of wage policy on output and productivity growth, taking into account the interactions between the demand and productivity regimes.
 - From eqs. 13 and 14 it follows that

$$\frac{d\hat{x}^*}{d\hat{w}} = \left[\frac{(1 - \beta_2)C}{1 + \beta_1 C} \right]$$

$$\frac{d\hat{\lambda}^*}{d\hat{w}} = \left[\frac{\beta_2 + \beta_1 C}{1 + \beta_1 C} \right]$$

Results

- Results for the productivity regime
 - The table reports the results for the two equations on the previous slide, distinguishing between the four different variants of C (with and without an assumed impact of redistribution on investment growth and calibrated on mean vs. up-to-date shares).

	(5) Output growth		(6) Productivity growth	
	C		C	
	With investment	Without investment	With investment	Without investment
At mean shares	-0.931	0.249	-0.319	0.491
At up-to-date shares	-0.453	-0.080	0.009	0.265

Results

- Results for the productivity regime
 - Taking account of the interactions between the demand and productivity regimes does not alter the earlier conclusion: **Swiss output growth is profit-led today.**
 - The **productivity regime**, however, is **wage-led** when C is calibrated on up-to-date shares.
 - This means that the direct positive effect of real wage growth on productivity growth ('wage induced technological progress') is stronger than its indirect negative effect that stems from real wage growth lowering demand growth, which in turn lowers productivity growth through the Verdoorn channel.

Results

- Comparing the model's predictions with reality
 - The three decades 1961-1990 were characterised by rising real unit labour costs in Switzerland.
 - In the wake of the protracted stagnation, which held the Swiss economy in its grip during most of the 1990s, wage moderation set in.
 - The first decade of the new millennium also saw declining real unit labour costs during most of the years.
 - Given the change in the average growth rates of world trade and the Swiss real wage between the 1961-1990 and the 1990-2008 periods, we can calculate the model's predictions for the change in the growth rates of Swiss GDP and labour productivity growth from eqs. 13 and 14.
 - The model's predictions can then be compared with the actual developments.

Results

	Growth rate 1961-1990	Growth rate 1990-2008	Δ
<i>Real observations</i>			
GDP (x)	2.6%	1.5%	-1.1 PP
Productivity (λ)	2.5%	1.1%	-1.4 PP
Employment (l)	0.1%	0.4%	0.3 PP
World trade (z)	7.2%	6.3%	-0.9 PP
Real wage (w)	3.2%	1.1%	-2.1 PP
<i>Model predictions</i>			
World trade effect on change in GDP growth	$\left[\frac{1}{1 + \beta_1 C} \right] \left[\frac{\psi_e \varepsilon_0}{1 - \psi_i \phi_2} \right] \Delta \hat{z}$		-1.9 PP
Wage moderation effect on change in GDP growth	$\left[\frac{(1 - \beta_2) C}{1 + \beta_1 C} \right] \Delta \hat{w}$		0.9 PP
Predicted change in GDP growth	$\Delta \hat{x}^*$		-1.0 PP
World trade effect on change in productivity growth	$\left[\frac{1}{1 + \beta_1 C} \right] \left[\frac{\psi_e \varepsilon_0}{1 - \psi_i \phi_2} \right] \beta_1 \Delta \hat{z}$		-1.3 PP
Wage moderation effect on change in productivity growth	$\left[\frac{\beta_2 + \beta_1 C}{1 + \beta_1 C} \right] \Delta \hat{w}$		-0.0 PP
Predicted change in productivity growth	$\Delta \hat{\lambda}^*$		-1.3 PP
Predicted change in employment growth	$\Delta \hat{l}^* = \Delta \hat{x}^* - \Delta \hat{\lambda}^*$		0.3 PP

Results

- Comparing the model's predictions with reality
 - The model's predictions are very precise.
 - The actual drop in real GDP growth by 1.1 percentage points (PP) and in productivity growth by 1.4 PP is predicted with an error margin of only 0.1 PP.
 - The increase in employment growth by 0.3 PP is exactly predicted.

Conclusion

- An estimated Bhaduri-Marglin model for Switzerland shows that **demand growth is profit-led** in this country.
- The preferred model specification (which includes a positive impact of wage moderation on investment growth) predicts the actual change in GDP growth after the inception of wage moderation around 1990 very well.
- It suggests that **wage moderation added almost one percentage point to GDP growth after 1990**.
 - In other words, the drop in real GDP growth, which was mainly caused by a slowdown in the international economy, would have been more severe without wage moderation.
 - Average GDP growth would have been little more than 0.5% instead of 1.5%.

Conclusion

- The results also show that **the productivity regime is wage-led in Switzerland.**
 - This means that wage moderation has contributed to the drop in productivity growth after 1990.
 - This effect, however, is weak.