Below we identify $(M_*)^\wedge$ via J with this translation invariant subspace. From the construction the following is obvious: If T is an identity preserving Schwarz map with preadjoint $T_* \in L(M_*)$, then $\hat{T}$ is an identity preserving Schwarz map on $\hat{M}$ such that $(T_*)^\wedge = \hat{T}'|(M_*)^\wedge$.

<u>Theorem</u> 2.5. Let $\mathcal{T}$ be an identity preserving semigroup of Schwarz type with generator A on the predual of a W*-algebra M. If $\mathcal{T}$ is uniformly ergodic with finite dimensional fixed space, then every $\gamma \in \sigma(A) \cap i\mathbb{R}$ is a pole of the resolvent $R(.,A)$ and $\dim \ker(\gamma - A) \leq \dim \operatorname{Fix}(\mathcal{T})$.

<u>Proof</u>. Let $D = \{\lambda \in \mathbb{C} : \operatorname{Re}(\lambda) > 0\}$ and R the M_*-valued pseudo-resolvent of Schwarz type induced by $R(.,A)$ on D. Then

$$P = \lim_{\mu \downarrow 0} \mu R(\mu)$$

exists in the uniform operator topology and $\operatorname{rank}(P) = \dim \operatorname{Fix}(\mathcal{T}) < \infty$. From this we obtain $\operatorname{rank}(P) = \operatorname{rank}(\hat{P}) < \infty$ where $\hat{P}$ is the canonical extension of P onto $(M_*)^\wedge$. Since $\hat{P} = \lim_{\mu \downarrow 0} \mu R(\mu)^\wedge$ it follows that

$$\dim \operatorname{Fix}((\lambda - i\alpha)\hat{R}(\lambda)) \leq \operatorname{rank}(\hat{P}) < \infty$$

(Proposition 2.1) for all $\alpha \in \mathbb{R}$. Therefore the assertion follows from Lemma 2.2.

□

The consequences of this result for the asymptotic behavior of one-parameter semigroups will be discussed in D-IV, Section 4.

<u>NOTES</u>.

<u>Section</u> 1. The Perron-Frobenius theory for a single positive operator on a non-commutative operator algebra is worked out in Albeverio-Høegh-Krohn (1978) and Groh (1981). The limitations of the theory (in the continuous as in the discrete case)